# ACACIA GALL-FUNGUS.

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A SERIOUS disease of wattle, *Acacia decurrens*, has become general throughout New Zealand in recent years, and so many inquiries concerning it have been made that this article is written to supply information as to its cause and remedial treatment.

The disease is noticeable on account of the conspicuous, dusty-brown galls present on the stems, branches, and pods. These may

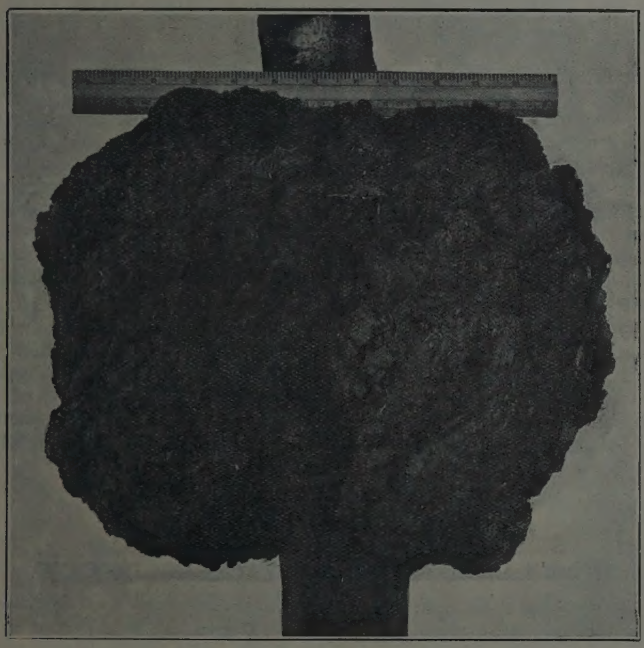

FIG. 1. GALL ON ACACIA-STEM, EXCEEDING 1 FT. IN DIAMETER.
[*Photo by H. Drake.*

remain for several seasons and, owing to their structure, seriously impair the work of the conduction-vessels of the branches; consequently the portions beyond the galls make little growth and produce few leaves. The tree thus suffers from partial starvation and eventually dies. In cases of severe infection trees may be killed outright in a season or so. A less noticeable feature of the disease is the production on leaves, petioles, and laterals of small, purple, blister-like spore-pustules.

or over-capitalization in plant and improvements; or is it faulty management?

(5.) To what extent can such operations as subdivision, pasture top-dressing, provision of supplementary crops, and culling and improvement of stock be carried on economically?

(6.) What is the earning-value of land under average management skill on different types of soil in different localities under average marketing conditions?

These are some of the features which an investigation into farm management and costs would enable us to answer. It has been found in other countries that the greatest saving can be effected by rectifying farming conditions first. When the production end of the business has been placed on a sound footing, then attention can be given to other important questions such as exist between the producer and the ultimate consumer.

It is with this object in view that the Department has instituted its economic research branch. The aim is to help the farmer in every way, but to enable this to be done the farmer must also help the Department. By hearty co-operation we believe it possible to equip the farmer with such knowledge that he will be able to make a better and more comfortable living from the land, to rear his family in greater comfort, to be of better service to the community, and to leave his farm more productive than it is at present. Such a study as here outlined, in conjunction with the scientific study of other problems confronting the farming industry, is calculated to promote individual prosperity and to increase national wealth.

The Department appeals to farmers and others to assist in this undertaking. An assurance is given that information supplied will be treated as strictly confidential, and that subsequent publication of findings will be made in such a way that the identity of the individual will be completely obliterated. The writer of this article will be glad to receive inquiries from any farmer who may be interested in the work and who is willing to co-operate.

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## INOCULATION AGAINST BLACKLEG DISEASE.

IN his annual report for 1925–26 the Director of the Live-stock Division states:—

Blackleg is still confined to the Taranaki District and to a portion of the Auckland Province. Inoculation of calves in the latter district is only carried out in cases where the disease has been confirmed, but in Taranaki the practice has been to vaccinate independently of whether outbreaks have been reported. The number of calves vaccinated during the year in Taranaki was 32,389, being an increase of 3,128 on the previous year. In remarking on the matter the District Superintendent, Wellington, makes the following comment, which I commend for consideration, as from the experience gained of the result of a similar policy in the Auckland District I am satisfied it is in the best interests of all concerned: "I think the time has arrived when a relaxation in the regulations dealing with this disease could very well be introduced in Taranaki, on similar lines to the procedure adopted in the Auckland District. The number of actual deaths reported as due to blackleg is very small compared with the volume of work entailed in general vaccination. No case of blackleg has occurred in the Hawera district for over three years."

The galls are commonly the size of a walnut, but may attain to a diameter of 1 ft. or more (Fig. 1). When sectioned they are seen usually to be tunnelled with the borings of insect larvæ, and this has led to the belief that the galls are due to insects. Such is not the case, however, for they are caused by one of the rust fungi, *Uromycladium notabile* McAlp., the spore masses of which cover the exterior of the galls, giving them a dusty-brown appearance. The insects are secondary, living at the expense of the gall, and are in no way connected with their formation.

Spores (uredospores) are produced on the exterior of the galls, and these are detached and carried by the wind to other plants in the vicinity, where, should conditions prove favourable, they may germinate and cause further infection. In this manner the disease quickly spreads throughout the trees in a plantation. The mycelium of the fungus perennates in these galls, and produce each season over a period of years quantities of spores. Therefore, once a tree becomes infected it is a constant source of infection for other trees planted in the vicinity. As has been mentioned, spore-pustules are also produced on leaves, petioles, and laterals. These consist of a second type of spore (teleutospore), which germinate on reaching maturity (usually during the summer months) and produce basidiospores, also capable of infecting any host plant on which they may alight.

FIG. 2. GALL CAUSING DISTORTION OF STEM OF YEARLING ACACIA DECURRENS.
[*Photo by H. Drake.*

Little was known of this rust until 1905, when McAlpine (1) made an intensive study of this and other rusts attacking species of the genus *Acacia* in Australia. He found that it and several others confined to this host genus belonged to an undescribed genus of fungi which he named *Uromycladium*. McAlpine described seven species of *Uromycladium*, occurring in all on twenty-seven species of *Acacia*, and showed that the genus was essentially an Australian one.

The disease has been introduced into New Zealand on seedling plants, and has then been spread by means of infected plants throughout both Islands (Fig. 3).

FIG. 3. GALLS (INDICATED BY ARROWS) ON SIX-MONTHS-OLD ACACIA-SEEDLINGS.

It is by the use of such plants that the disease is disseminated.

[*Photo by H. Drake.*

The species discussed above, *Uromycladium notabile*, usually occurs on *Acacia decurrens*, but it is not confined to this host, having been frequently collected on *A. Bayleyana* and occasionally on *A. dealbata*; in Australia and Tasmania it has in addition been recorded by McAlpine as attacking *A. binervata*, *A. elata*, *A. notabilis*, and *A. pruinosa*.

A second gall-forming species, *Uromycladium Tepperianum* McAlp., has been found in Auckland to attack prickly-acacia, *A. armata*, producing thereon a gall similar to that formed by *Uromycladium notabile*. In Australia and Tasmania this latter species appears to be abundant, for McAlpine records it on the following nineteen species of acacia: *A. armata, A. diffusa, A. erioclada, A. glaucoptera, A. hakeoides, A. implexa, A. juniperina, A. longifolia, A. melanoxylon, A. myrtifolia, A. pycnantha, A rigens, A. salicina, A. siculiformis, A. spinescens,*

FIG. 4. SHOWING EFFECT OF GALLS ON LATERALS.

On right: Primary infection; note torsion, and that terminal portion of lateral continues beyond gall.

On left: Old gall showing destruction of terminal leaf-bearing portion of lateral.

[*Photo by H. Drake.*

*A. stricta, A. verniciflua, A. verticellata,* and *A. vomeriformis*. This species is stated to have been found also in Java on *Albizzia montana* (4).

Of the five other species recorded for Australia by McAlpine, three—*Uromycladium Acaciæ, U. alpinum,* and *U. Robinsoni*—have been collected in New Zealand (2, 3); but as they do not produce galls, and consequently do little damage to the host plants, they are of minor economic import.

REMEDIAL TREATMENT.

Nothing can be done with a tree once it has become infected. It has been suggested that the galls be removed and the sources of infection thereby destroyed. But this is impracticable, for, as has been shown, a second form of spore is present on the leaves, petioles, and laterals, which would lead to further infection.

FIG. 5. POD-INFECTION.

The galls usually destroy the pods, so that it frequently becomes difficult to secure seed from severely infected trees.

[*Photo by H. Drake.*

Avoidance of infected plants used in planting is the only method at hand whereby infection may be obviated. For this purpose it is necessary to secure seed from trees free from the disease, and to sow it in an area removed from the vicinity of infected trees. The common nursery practice of sowing seed from infected trees in their vicinity should be avoided. It is through this means that the disease has

become so widely disseminated throughout New Zealand in recent years, for the seedling plants become infected in the nursery through spores wind-borne from neighbouring infected trees, and carry the disease with them wherever they may be planted.

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The writer is indebted to Mr. T. Rodda, Manager of the Te Kauwhata Horticultural Station, for information concerning the incidence and behaviour of the acacia gall-fungus at Te Kauwhata, and for forwarding specimens; and to Mr. H. Drake, of this Laboratory, for the accompanying photographs taken therefrom.

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## NAURU AND OCEAN ISLANDS PHOSPHATE.

THE following is extracted from a statement on this subject in the annual report of the Director-General of Agriculture for 1925–26:—

"There are no harbours at the islands, the steamers during loading operations lying in the open roadstead anchored to special moorings which are in deeper water than perhaps any others in the world. Loading is carried out through the medium of lighters, hence shipping operations are governed almost entirely by weather conditions. For the first five years of the British Phosphate Commission's operations the weather interfered very little with loading operations, with the result that all orders from partner countries were promptly filled and surplus production disposed of to other countries at very profitable market rates. These conditions, which favoured a maximum output so necessary where heavy overhead charges are inevitable, were reflected in a gradually decreasing c.i.f. cost., with corresponding benefits to purchasers of the manufactured superphosphate. Unfortunately, very unfavourable weather conditions were experienced for a considerable portion of the year 1925–26, with the result that shipping operations were delayed, storage limits at the islands were reached, and it was impossible to supply from the islands all of the requirements of the partner countries. In order to furnish the manufacturers with raw material, and so ensure adequate supplies of superphosphate for consumers in the partner countries, the British Phosphate Commission, acting for the manufacturers, met the position by purchasing from the most favourable sources of supply (including Florida, U.S.A., and Morocco) the large quantities of phosphate rock needed to meet the deficiency. These purchases were, of course, at a greater cost than Nauru and Ocean Islands phosphate, but, in order to avoid fluctuations in the prices of superphosphate due to varying prices for the raw material, the Commission agreed to distribute the extra cost of the needed outside supplies by increasing by a small amount per ton the selling-price for the year commencing on the 1st July, 1926, and making the sales on terms convenient to the purchasers.

"Extensive improvements in the storage and shipping facilities at the islands are being arranged by the Commission with the object of reducing costs of production, increasing the output, and making possible speedier loading of vessels, and so utilizing to the utmost weather conditions favourable to the loading of ships. These works will take a number of years to effect, but when completed will enable the output to be greatly increased."

# TREATMENT OF IRON-HUNGER IN STOCK.

## THE PROPER USE OF IRON-AMMONIUM CITRATE.

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THE use of double citrate of iron and ammonium in the prevention and cure of iron-hunger (bush sickness) has been so successful at Mamaku that many farmers on the sandy silt and coarser pumice lands have taken advantage of this Department's offer to supply the drug to *bona fide* farmers at cost price—3s. 3d. per pound—through the Stock Inspectors at Rotorua and Tauranga. So far as can be learnt, favourable results are being experienced by those who are trying the drug and who follow the instructions. It is important that the instructions should be followed as already given in the *Journal*. They are here repeated for general information :—

The dose for a cattle beast is 2 fluid ounces of a 6-per-cent. solution twice daily; 1 lb. of the crystals may be dissolved in 13½ pints of water to make this solution. The medicine may be sprinkled on hay or other fodder for ease of administration. For younger animals the dose should be proportionately reduced.

Some farmers have mistaken the directions to dissolve the drug in water and give 2 oz. of the solution, and have given 2 oz. of the solid scales. This is a serious mistake, and is likely to have injurious rather than beneficial results on the stock so treated.

It is convenient here to summarize the full authoritative method of coping with iron-hunger in stock. The following is the official recommendation for farming-lands of the volcanic soil province classified as sandy silts and gravelly sands of the Rotorua County (see map published in the issue of this *Journal* for June last) :—

(1.) Farm more highly; get the plough in; compact the soil; grow plenty of winter feed; and save plenty of hay. Subdivide into smaller paddocks, and keep the pastures eaten short. Top-dress with phosphate—preferably containing iron or in conjunction with iron sulphate—as frequently as is the practice to top-dress in the Waikato. Treat the stock well, especially in the matter of water-supply.

(2.) Use molasses freely in the feeding, especially in rearing young stock. Regard molasses as a preventive, but not as a cure.

(3.) When an animal shows signs of going back in condition owing to iron-hunger, give iron-ammonium citrate as supplied by the Mamaku Demonstration Farm, and by the Stock Inspectors at Rotorua and Tauranga, at cost price to *bona fide* farmers.

(4.) Buy any stock required from districts remote from the affected pumice land, and under conditions which ensure that the animals are free from disease or parasitic infection. Lack of the mineral elements is known to predispose an animal to other diseases and ailments, which, when introduced on to a farm on sick country, run a rapid course in the stock.